TITLE OF THE INVENTION

APPLICATION DEVICE

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APPLICATION DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims priority under 35 U.S.C. §119 of German Patent Application No. 101 15 726.6; filed on March 30, 2001, the disclosure of which is expressly incorporated by reference herein in its entirety.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] The invention relates to an application device, in particular for a paper machine, having a plurality of nozzle units arranged at a respective distance from one another. Such application devices are known, for example, from DE-C-39 29 561, EP-A-0 960 656, and DE-A-199 21 592.

2. Discussion of Background Information

[0003] Up to now machine-wide spraying pipes have been used in paper machines in order e.g. to moisten or clean the covering, dewatering elements, rolls, or machine elements with a fluid. These spraying pipes are either stationary or are provided such that they can execute a positioning lift that can be a multiple of the distance between two adjacent nozzles. If the functioning of one or several nozzles is interrupted, it necessarily also results in a corresponding interruption of the moistening profile formed transverse to the machine in the area of the effective width of a respectively interrupted nozzle. The resulting cross direction profile thus becomes uneven. Moreover, the oscillating spraying pipes have the disadvantage that markings can occur in the area of the reversal points.

SUMMARY OF THE INVENTION

[0004] The invention resides in creating an improved application device of the type mentioned at the outset with which, in particular even in the case of an interruption or a breakdown of one or more nozzle units, a moistening profile is ensured that is as undisturbed as possible.

[0005] This object is achieved according to the invention by way of an application device, in particular for a paper machine, having a plurality of nozzle units arranged at a respective distance from one another, which nozzle units are conducted on a closed rotating path generally extending transverse to the machine travel direction.

[0006] Based on this design, even if one or more nozzle units are interrupted or even fail completely, an undisturbed moistening profile is ensured. Provision is therefore made at all times, for example, for a uniform water distribution during the time period over the area to be moistened. In particular, it is therefore also possible, in particular, for a moistening profile transverse to the travel direction of the machine in question to be made uniform.

[0007] It is preferable for the distances between the rotating nozzle units to be equal. In an advisable, practical embodiment of the application device of the invention, the nozzle units rotate at mutually constant distances from one another.

[0008] The nozzle units can in particular rotate continuously.

[0009] In an advisable practical embodiment of the application device according to the invention, the rotating path extends at least essentially over the entire machine width.

[0010] The nozzle units can each include one or more nozzles.

[0011] In an advisable practical embodiment, the nozzle units each include at least one pin-type and/or fan nozzle. In principle, however, other types of nozzles can also be used.

[0012] The nozzle units can be fed for example with water and/or at least one chemical conditioning agent. Binders are named as conditioning agents solely by way of example. In

principle, however, any other desired conditioning agents are also conceivable.

[0013] In a preferred practical embodiment of the application device according to the invention, devices are provided for controlling and/or regulating the moistening cross direction profile, the rate of flow, the rotation speed, and/or the like.

[0014] Appropriately, the nozzles in the nozzle unit can be tested for their function by a test device outside the machine-wide effective zone, and can be cleaned by a cleaning device.

[0015] It is also advantageous if the direction of movement can be reversed after a complete rotation.

[0016] In certain cases it may also be advisable if the nozzle units can be swivelled away from or towards the element to be impinged at a respective reversal point of the rotation. Thus the nozzle units can each be rotated e.g. by 90° at a relevant reversal point.

[0017] According to an aspect of the invention, an application device for impinging on an element of a machine comprises a rotating guide and a plurality of nozzle units mounted on said rotating guide, and arranged at a respective distance from one another, the nozzle units being conveyed in a closed rotating path in a first direction extending generally transversely to a machine travel direction. The machine may comprise a paper making machine.

[0018] The element of the paper making machine further comprises a web being subjected to a moistening cross direction profile by the nozzle units which rotate at a rotation speed and deliver a rate of flow to the web. The application device further comprises at least one device for at least one of, controlling and regulating the at least one of, moistening cross direction profile, the rate of flow, and the rotation speed of the nozzle units.

[0019] The application device further comprises a test device located outside an effective zone of the width of the machine for testing a function of the at least one nozzle in the nozzle units and a cleaning device for cleaning the at least one nozzle in the nozzle units.

[0020] According to another aspect of the invention, the distances between the nozzle units are equal. The nozzle units may rotate at reciprocally constant distances from one another. Further, the nozzle units may rotate continuously. The machine has a width and the rotating path extends at least essentially over the entire machine width.

[0021] Each of the nozzle units includes at least one nozzle. The application device further comprises a test device located outside an effective zone of the width of the machine for testing a function of the at least one nozzle in the nozzle units and a cleaning device for cleaning the at least one nozzle in the nozzle units.

[0022] Each of the nozzle units may include at least one of a pin-type and fan nozzle. The nozzle units are fed with at least one of water and at least one chemical conditioning agent.

[0023] According to the invention, the first direction of rotation is reversed at a reversal point after a complete rotation of the nozzle units. Furthermore, the nozzle units are swivelable in a direction away from or towards the element to be impinged at a respective reversal point of the rotating path.

[0024] Moreover, according to the invention, an application device for impinging on a web of a paper making machine comprises a plurality of nozzle units arranged at a respective distance from one another, each nozzle unit including at least one nozzle for subjecting the web to a moistening cross direction profile. The nozzle units are conveyed at a rotation speed in a closed rotating path in a first direction extending generally transversely to a machine travel direction, the plurality of nozzle units delivering a rate of flow to the web. At least one device is provided for at least one of, controlling and regulating the at least one of, moistening cross direction profile, the rate of flow, and the rotation speed of the nozzle units. The machine has a width and the rotating path extends at least essentially over the entire machine width. A test device is located outside an effective zone of the width of the machine for testing a function of the at least one nozzle in the nozzle units. A cleaning device is provided

for cleaning the at least one nozzle in the nozzle units, wherein the nozzle units are fed with at least one of water and at least one chemical conditioning agent.

[0025] Other exemplary embodiments and advantages of the present invention may be ascertained by reviewing the present disclosure and the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] The present invention is further described in the detailed description which follows, in reference to the noted plurality of drawings by way of non-limiting examples of embodiments of the present invention, in which like reference numerals represent similar parts throughout the several views of the drawings, and wherein:

[0027] Figure 1 shows a schematic representation of an exemplary embodiment of an application device and

[0028] Figure 2 shows a schematic representation of another embodiment of the application device.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

[0029] The particulars shown herein are by way of example and for purposes of illustrative discussion of the embodiments of the present invention only and are presented in the cause of providing what is believed to be the most useful and readily understood description of the principles and conceptual aspects of the present invention. In this regard, no attempt is made to show structural details of the present invention in more detail than is necessary for the fundamental understanding of the present invention, the description taken with the drawings making apparent to those skilled in the art how the several forms of the present invention may be embodied in practice.

[0030] Figure 1 shows, in a purely schematic representation, an exemplary embodiment of an application device that in the present case is formed for example by a conditioning device 10. It can among other things take on e.g. the function of a spray- or cleaning spraying pipe or a nozzle moistener. In principle, however, any other functions are also conceivable.

[0031] By way of this conditioning device 10, an element 12 to be impinged or to be moistened is impinged with a medium such as for example liquid and/or a chemical conditioning agent, e.g. a binder. The element 12 to be impinged can be in particular an element 12 moved preferably in machine travel direction L, e.g. a felt or the like. Conditioning device 10 can for example be used thereby for moistening covers, dewatering elements, rolls, or other machine elements, in particular of paper machines used for the production of a paper- or cardboard web.

[0032] As can be seen from Figure 1, conditioning device 10 includes a plurality of nozzle units 14 arranged at a respective distance a from one another, which nozzles are all conducted on a closed rotating path extending generally transverse to machine travel direction L. These nozzle units 14 are thereby moved by the appropriate drive on the rotating path in the direction of the arrow F.

[0033] The distances a between nozzle units 14 can be equal. In the present case, the nozzle units 14 rotate in direction of rotation F at reciprocally constant distances a, preferably continuously.

[0034] The rotating path can extend at least essentially over the entire machine width.

[0035] The various nozzle units 14 can include respectively one or more nozzles. Pin-type and/or fan nozzles can be used as the nozzles, for example.

[0036] As can be seen from Fig. 1, conditioning device 10 includes a rotating guide 16 and a nozzle carrier 18 on which the nozzle units 14 are conducted.

[0037] Nozzle units 14 can be fed, for example, with water and/or at least one chemical conditioning agent. Binders are named as conditioning agents solely by way of example.

[0038] Moreover, devices can be provided for controlling and/or regulating the moistening cross direction profile, the rate of flow, the rotation speed, and/or the like.

[0039] With this conditioning unit, therefore, a type of endless spraying pipe results, the nozzle units 14 or nozzles of which all rotate on a rotating path. Thus even in the case of one or more possible defective nozzle units 14', a uniform distribution of the relevant medium, e.g. water and/or chemical conditioning agent, over time, over element 12 to be impinged, is ensured. Thus a uniformity e.g. of the moistening profile transverse to the machine is achieved in case of an interruption or even a breakdown of one or more nozzle units 14.

[0040] Nozzle units 14 can be arranged for example on a rotating belt or the like.

[0041] Fig. 2 shows another embodiment in which the rotating belt is arranged so that the nozzle units 14 impinge element 12 to be impinged, e.g. a felt or the like, on only one side of the rotating path, i.e. only in one travel direction. The opposite side or returning side operates in a collecting vessel, or is switched off.

[0042] In contrast to the representation in Figure 1, nozzle units 14 are rotated by 90° at the respective reversal point 20. While nozzle units 14 on the right side are directed at element 12 to be impinged, e.g. a felt (cf. arrow a in Fig. 2), they are correspondingly no longer directed at this element 12 on the left side (cf. arrow b in Fig. 2).

[0043] The advantage of this embodiment resides in the fact that no intersections of the water jets occur that could lead to moisture peaks or other disturbances.

[0044] It is noted that the foregoing examples have been provided merely for the purpose of explanation and are in no way to be construed as limiting of the present invention. While the present invention has been described with reference to an exemplary embodiment, it is understood that the words which have been used herein are words of description and

illustration, rather than words of limitation. Changes may be made, within the purview of the appended claims, as presently stated and as amended, without departing from the scope and spirit of the present invention in its aspects. Although the present invention has been described herein with reference to particular means, materials and embodiments, the present invention is not intended to be limited to the particulars disclosed herein; rather, the present invention extends to all functionally equivalent structures, methods and uses, such as are within the scope of the appended claims.

List of reference numbers

10	Application device, conditioning device
12	Element to be impinged
14	Nozzle unit
14′	Defective nozzle unit
16	Rotating guide
18	Nozzle carrier
20	Reversal point
a	Distance
F	Direction of rotation
L	Machine travel direction